

DRAFT

Rationale For Proposed Revisions To Ambient Water Quality Criteria For Bacteria



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DRAFT RATIONALE FOR PROPOSED REVISIONS TO AMBIENT WATER QUALITY CRITERIA FOR BACTERIA

Background

Water quality criteria for bacteria are concentrations of indicator organisms that should not be exceeded in order to protect human health from pathogen-caused illness. Water bodies may contain many different pathogens that cannot be measured directly; therefore, indicator organisms are used to predict the health risks from pathogens residing in water bodies. These indicator organisms are often not the direct cause of an illness, but have demonstrated characteristics that make them good predictors of whether harmful pathogens, such as viruses, protozoa, bacteria, and other disease-causing microorganisms, are present in the water bodies.

The Clean Water Act requires EPA to periodically update ambient water quality criteria. EPA's most recent recommended water quality criteria for bacteria have been set forth in the guidance document, Ambient Water Quality Criteria for Bacteria – 1986 and Implementation Guidance for Ambient Water Quality for Bacteria – May 2002 (Draft). In these guidance documents, EPA has recommended that either *Escherichia coli* (*E. coli*) or enterococci be used to predict the presence of gastrointestinal illness causing pathogens in freshwater and that enterococci be used for marine waters.

EPA obtained the data supporting the recommended bacterial water quality criteria from a series of research studies conducted examining the relationship between swimming-associated illness and the microbial quantity in the waters used for swimming and other recreational activities. The results of these studies demonstrated that fecal coliforms, the indicator organism originally recommended in 1968 by the Federal Water Pollution Control Administration did not provide a good correlation to swimming-associated illnesses. Other indicator organisms such as *E. coli* or enterococci were determined to provide a better correlation in fresh waters, while enterococci showed good correlations in both fresh and marine waters. Consequently, EPA has recommended that *E. coli* or enterococci rather than fecal coliforms be implemented as the bacterial indicator in states, territories, and tribal water quality programs.

Ambient Water Quality Criteria for Bacteria

Prior to publication of the recommended 1986 water quality criteria for bacteria, EPA supported States applying bacterial water quality criteria to waterbodies impaired or potentially impacted by the presence of human fecal contamination. This policy was based on the absence of data correlating non-human sources of fecal contamination and human illness; and on the belief that pathogens originating from non-human sources presented an insignificant risk of gastrointestinal illness in humans.

During promulgation of the 1986 bacteria water quality criteria, research studies and data reviewed by EPA indicated that warm-blooded animals other than humans could potentially transmit pathogens capable of causing gastrointestinal illness in humans. Therefore, EPA changed its policy regarding non-point, i.e., non-human sources of fecal pollution in water bodies. In the 1986 guidance document, the Agency recommended that the bacteria water quality criteria be applied to all water bodies that could be used for recreational activities and no distinction be made between human and non-human sources of contamination.

For water quality programs to be fully protective of human health from bacterial-related illnesses, the water quality criteria for bacteria recommended by EPA consists of two elements: a geometric mean value and a single sample maximum value (based on the frequency of use of the water body). There have been misconceptions in the implementation of the geometric mean bacterial water quality criteria, in particular, the interpretation that a minimum number of samples were required to determine attainment of bacterial water quality criteria. Previous guidance by EPA recommended that the geometric mean be based on five samples taken over a 30-day period. This recommendation was intended for accuracy purposes only, and was not intended to imply that five samples are needed before a geometric mean can be calculated. EPA's position as outlined in the bacterial water quality guidance documents is unless specified otherwise in a state or authorized tribal water quality standards or assessment methodology (303(d) listing), the geometric mean should be calculated based on the total number of samples collected over a specific monitoring period. The bacterial geometric mean in conjunction with the single sample maximum value will be used to determine whether or not a waterbody is impaired

EPA Recommendations

The EPA recommended freshwater bacterial water quality criteria are listed below in Table 1. (EPA Implementation Guidance for Ambient Water Quality Criteria for Bacteria - May 2002 (Draft)).

Table 1. EPA recommended freshwater bacterial water quality criteria.

		Single Sample Maximum Allowable Values (number/100 ml)			
Indicator	Geometric Mean Value	Designated Beach Area	Moderate Full Body Contact Recreation	Lightly Used Full Body Contact Recreation	Infrequent Used Full Body Contact Recreation
<i>E. coli</i>	126	235	298	410	576
Enterococci	33	62	78	107	151

The bacterial water quality criteria would consist of a geometric mean and single sample maximum allowable value based on the frequency of use of the waterbody and the corresponding degree of full body contact with the water. Both the geometric mean and single sample maximum values were derived based on specific illness rates. When EPA promulgated changing the indicator organism used to measure bacterial water quality, an illness rate of 8 illnesses per 1000 swimmers in fresh waters and 19 illnesses per 1000 in marine waters were used to derive the new criteria. These illness rates provided a similar level of protection as had been previously provided by the fecal coliform criteria.

The freshwater single sample maximum allowable bacterial-indicator values were developed by EPA to provide the level of protection as described above based on the frequency of use of the waterbody. The most conservative single sample maximum value was assigned to beach areas because a more conservative approach should be taken in the protection of heavily-used recreational waterbodies. Conceivably, less intensively used areas may have less restrictive single sample limits applied to them.

Surface waterbodies contained in the Nevada water quality regulations (NAC 445A) are designated for either water contact recreation or non-contact recreation. Water contact recreation involves activities where contact with the water occurs and the potential for immersion in and ingestion of the water exists. The bacterial water quality criteria outlined in Table 1 would be protective of the

waterbodies with a water contact designation. Non-contact recreational use of a waterbody has been interpreted to mean recreational activities incident to shoreline activities that generally do not involve immersion in the water. EPA has recommended that for those waterbodies used for recreational activities where very little direct contact with the water occurs and where ingestion of water is unlikely, a criterion equal to five times that of the geometric mean proposed for water recreational uses be adopted. EPA has not recommended a non-contact recreational use single-sample maximum value for *E. coli* or enterococci at this time.

The guidance set forth in the 1986 bacterial water quality document encourages states, territories, and authorized tribes to adopt the newly recommended water quality for bacteria; thereby replacing existing bacterial water quality criteria for total or fecal coliforms. To ensure consistency and continuity in regulatory programs, EPA has recommended that both fecal coliforms and *E. coli*/enterococci be included in water quality standards for a limited period of time. This approach would allow states, territories, and tribes to establish an adequate database for *E. coli* and/or enterococci that would support subsequent revisions of bacterial water quality criteria in their water quality programs

The transition to the recommended bacteria criteria will be a priority for EPA during upcoming triennial reviews of water quality standards. If the recommended bacterial water quality criteria are not implemented during this period, EPA intends to act under the auspices of the Clean Water Act to promulgate federal water quality standards, with the goal of assuring that EPA's recommended 1986 bacteria water quality criteria be implemented in all water quality programs, as appropriate, by 2003 (EPA Implementation Guidance for Ambient Water Quality Criteria for Bacteria, May 2002 Draft).

Proposed Revisions to Bacterial Water Quality Standards contained in State of Nevada Regulations

NDEP is proposing a state-wide revision to the bacterial water quality criteria. This proposal will involve incorporating recommended 1986 bacterial water quality criteria for *E. coli* (a geometric mean determined on an annual basis and a single sample value) into the water quality standards. After consultation with the Nevada State Health Laboratory, *E. coli* rather than enterococci was selected as the freshwater bacterial indicator to be adopted by NDEP.

The following *E. coli* water quality criteria are proposed for inclusion in the Nevada water quality standards.

For waters with Water Contact Recreation as a beneficial use and which have a designated beach area:

Annual Geometric Mean (A.G.M.)	<126 per 100 ml
Single Sample Value (S.V.)	<235 per 100 ml

For waters with Water Contact Recreation as a beneficial use and which do not have a designated beach area:

Annual Geometric Mean (A.G.M.)	<126 per 100 ml
Single Sample Value (S.V.)	<410 per 100 ml

For waters with Non-Contact Recreation as a beneficial use:

Annual Geometric Mean (A.G.M.)	<630 per 100 ml
(based on 5 x 126 per 100 ml (A.G.M.) for water contact recreation)	

For a period of time, the NAC water quality regulations will contain two bacterial water quality standards; the recommended *E.coli* criteria and the existing fecal coliform standards for water recreational uses. During future triennial reviews, the fecal coliform bacterial water quality criteria will be modified to protect the other designated waterbody uses such as irrigation, watering of livestock, non-contact recreation, and municipal and domestic supply.

At this time, NDEP is not proposing to revise the bacterial criteria in the water quality standards for the Class Waters (NAC 445A.123 through NAC 445A.127); Smoke, Bronco, and Gray Creeks (NAC 445A.180 to 445A.182); Lake Tahoe and tributaries (NAC 445A.191 and 1915); Lake Mead (NAC 445A.195 and 445A.197); and Las Vegas Wash (NAC 445A.198 to 445A.201). The class waters and Lake Mead water quality standards are currently being reviewed by NDEP. Appropriate changes to the bacterial water quality criteria will be made when the standards for these waters are assessed as part of NDEP's triennial review schedule of established water quality standards.

NDEP is assisting the Lahontan Regional Water Quality Control Board (LRWQCB) with developing Lake Tahoe Total Maximum Daily Loads (TMDLs). Through the TMDL process, water quality standard changes may be identified. Following completion of the technical TMDLs in 2004, NDEP will consider reviewing Lake Tahoe water quality standards.

Smoke, Bronco, and Gray Creeks do not have beneficial uses defined in their water quality regulations. Future reviews of these waterbodies will address the addition of beneficial uses and incorporation of appropriate *E. coli* water quality criteria.

The fecal coliform levels contained in the Las Vegas Wash standards are a reflection of permit limits placed on point source discharges to the Wash. Under the Clean Water Act and the implementing federal regulations, states and authorized tribes have flexibility in how they translate water quality standards into permit limits to ensure attainment of designated uses. Consequently, in the interim, it is proposed that the fecal coliform limits for the Las Vegas Wash continue to be enforced through the existing permit's term, and that new *E. coli* water quality criteria be incorporated at the time of permit reissuance. As the permits for discharges to Las Vegas Wash are updated, the water quality standards for the Wash will also be updated (EPA Implementation Guidance for Ambient Water Quality Criteria for Bacteria, May 2002 Draft).

Authorized tribes have independent authority for setting water quality standards and implementing regulations for waters on reservation lands under the 1987 Amendments to the Clean Water Act. At this time, the State of Nevada regulations include water quality standards for waterbodies on tribal lands throughout Nevada. However, the State of Nevada has no authority to set standards on tribal lands, therefore, the water quality standards contained in NAC 445A.168 (Walker River at Schurz Bridge), NAC 445A.190 (Truckee River at Pyramid Lake), and NAC 445A.224 (East Fork Owyhee River at the Nevada-Idaho stateline) are not proposed to be modified to include *E. coli* as the bacterial-indicator water quality criteria.

The water quality regulations proposed for revision are shown in Table 2. The river systems and specific waterbodies have been categorized depending on whether they have a designated use of

water contact recreation or non-contact recreation. The existing bacterial water quality standards and the proposed new *E. coli* criteria for the waterbodies are listed.

Affect of Proposed Regulation Changes on Standards Compliance

Fecal coliform bacterial levels in water quality monitoring samples routinely collected from Nevada designated waterbodies have generally been in compliance with the existing fecal coliform bacterial standards. The Muddy River appeared on the 1994 303(d) list of impaired waterbodies for fecal coliform. Although exceedances of fecal coliform standards have occurred since 1994, the number of violations has not been enough to result in a waterbody being listed as impaired on subsequent 303(d) lists. While adoption of *E. coli* standards could result in a number of waterbodies being included in the next 303(d) list, this does not mean that the *E. coli* criteria are more stringent than the existing fecal coliform standards. Changes that have been made by NDEP in the draft 303(d) listing methodology - a 10% exceedance of water quality standards rather than 25% as had been used for previous lists, and the fact that *E. coli* is a better indicator of the presence of waterborne pathogens may result in certain waterbodies being included in future 303(d) lists for bacterial water quality exceedances.

Since the early 1990's, NDEP has been collecting water samples for *E. coli* analyses as a component of its surface waters monitoring program. Available *E. coli* water chemistry data for the major river systems (Carson, Snake, Truckee, Colorado, Muddy, Virgin, Walker, and Humboldt) were compiled and evaluated to determine whether the *E. coli* levels in these waterbodies will be in compliance with the proposed EPA recommended standards. The *E. coli* levels in water samples collected over the time period 1997 to 2001 from monitoring control points on the aforementioned rivers were evaluated in accordance with the draft methodology used to develop the 2002 303(d) list (as explained below). The results of the evaluation are included in the Appendix section of this document. For each river system, the proposed *E. coli* standards for the various control points on the rivers are shown as "unshaded" sections in the tables. *E. coli* levels in the samples collected over the five year period were compared to the proposed single-value water quality criteria.

Table 2. Nevada water quality regulations proposed for revision to include EPA recommended E. Coli water quality standards.

Water Contact Recreation Beneficial Use	Water Quality Regulations	Existing Fecal Coliform Water Quality Standard	Proposed E. Coli Water Quality Std.
Carson River	NAC 445A.147 to 157	See Footnote 1	See Footnote 3
Carson River	NAC 445A.158	See Footnote 1	See Footnote 4
Walker River	NAC 445A.160, 162 to 167, and 169	- - -	See Footnote 3
Walker River	NAC 445A.161	- - -	See Footnote 4
Chiatovich Creek	NAC 445A.171	See Footnote 1	See Footnote 3
Indian Creek	NAC 445A.172	See Footnote 1	See Footnote 3
Leidy Creek	NAC 445A.173	See Footnote 1	See Footnote 3
Beaver Dam Wash	NAC 445A.178	See Footnote 1	See Footnote 3
Snake Creek	NAC 445A.179	See Footnote 1	See Footnote 3
Truckee River	NAC 445A.184 to 189	See Footnote 1	See Footnote 3
Colorado River	NAC 445A.192 to 193	See Footnote 1	See Footnote 4
Humboldt River	NAC 445A.203 to 208	See Footnote 1	See Footnote 3
Snake River System	NAC 445A.215 to 223, 225	See Footnote 1	See Footnote 3
Non-Contact Recreation Beneficial Use			
Virgin River	NAC 445A.175 to 177	See Footnote 2	See Footnote 5
Muddy River	NAC 445A.210 to 212	See Footnote 2	See Footnote 5

Footnotes:

- 1 Based on the minimum of not less than 5 samples taken over a 30-day period, the **fecal coliform** bacterial level may not exceed a geometric mean of 200 per 100 ml nor may more than 10 percent of the total samples taken during any 30-day period exceed 400 per 100 ml.
- 2 **Fecal coliform** bacterial levels: annual geometric mean (A.G.M.) of <1000 per 100 ml and single value (S.V.) of <2000 per 100 ml.
- 3 **E. coli** bacterial levels (No./100 ml): annual geometric mean (A.G.M.) of <126 per 100 ml and single value (S.V.) of <410 per 100 ml.
- 4 **E. coli** bacterial levels (No./100 ml): annual geometric mean (A.G.M.) of <126 per 100 ml and single value (S.V.) of < 235 per 100 ml.
- 5 **E. coli** bacterial levels (No./100 ml): annual geometric mean (A.G.M.) of <630 per 100 ml.

The number of standard violations was identified and the corresponding percent exceedance was determined. Additionally, for each river system, geometric means were calculated for each of the 5-years and compared to the proposed *E. coli* annual geometric mean (A.G.M.) standard. The monitoring control point locations on the various rivers where *E. coli* A.G.M.'s were in exceedance of the proposed criteria are shown in the Appendix tables.

According to the draft methodology developed by NDEP for the 2002 303(d) list, waters are listed as impaired if during the five-year listing period more than 10% of the samples exceed a particular water quality single value standard and/or if an annual average or annual geometric mean standard is exceeded at least once. As shown in the Appendix, a 10% exceedance of the proposed *E. coli* single value criteria of 410 per 100 ml was determined at 2 of 11 monitoring control points on the Carson River system; at 2 of 9 monitoring control points on the Snake River system; and at 1 of 10 monitoring control points on the Walker River system. For those waterbodies with a designated beach area, *E. coli* levels in the water samples collected from these control points were in compliance with the proposed *E. coli* standard of 235 per 100ml. Calculated *E. coli* A.G.M.'s greater than the proposed criteria of 126/100 ml for water contact recreation were determined at monitoring control points on the Snake and Walker Rivers.

APPENDIX

Assessment of *E. coli* water quality monitoring data collected over the time period 1997 to 2001 for the Carson, Snake, Truckee, Colorado, Muddy, Virgin, Walker, and Humboldt River Systems.

CARSON RIVER SYSTEM

Designated Use: Contact Water Recreation

Monitoring Location	<i>E.coli</i> Single Value "Exceedances" (1997 to 2001)				
	Proposed Criteria	"Beach Use" Water Contact	"Moderate Use" Water Contact	"Light Use" Water Contact	"Infrequent Use" Water Contact
	Single Values:	235/100 ml	298/100 ml	410/100 ml	576/100 ml
No. Samples					
West Fork at Paynesville (NAC 445A.147)	29	2 exceedances 7%	2 exceedances 7%	2 exceedances 7%	0 exceedance 0%
East Fork at Riverview (NAC 445A.150)	28	1 exceedance 4%	1 exceedance 4%	1 exceedance 4%	1 exceedance 4%
East Fork at Muller Lane (NAC 445A.151)	28	2 exceedances 7%	2 exceedances 7%	1 exceedance 4%	1 exceedance 4%
Carson at Genoa Ln (NAC 445A.152)	29	4 exceedances 14%	3 exceedances 10%	1 exceedance 3%	1 exceedance 3%
Carson at Crdlbgh Bridge (NAC 445A.153)	28	5 exceedances 18%	5 exceedances 18%	1 exceedance 4%	1 exceedance 4%
Carson at Mexican Gage (NAC 445A.154)	28	4 exceedances 14%	2 exceedances 7%	1 exceedance 4%	0 exceedance 0%
Carson at New Empire (NAC 445A.155)	28	5 exceedances 18%	4 exceedances 14%	4 exceedances 14%	1 exceedances 4%
Carson at Dayton (NAC 445A.156)	27	2 exceedances 7%	2 exceedances 7%	1 exceedance 4%	1 exceedance 4%
Carson at Weeks (NAC 445A.157)	28	4 exceedances 14%	4 exceedances 14%	4 exceedances 14%	1 exceedances 4%
Carson below Lahontan Dam (NAC 445A.158)	21	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Bryant Creek at Doud Spr. (NAC 445A.148)	21	4 exceedances 19%	1 exceedance 5%	1 exceedance 5%	0 exceedance 0%

Footnote: Proposed bacterial criteria for control points shown as unshaded boxes under numerical single-value limits.

No exceedances of *E. coli* Annual Geometric Mean criteria at Carson River control points.

SNAKE RIVER SYSTEM

Designated Use: Contact Water Recreation

	<i>E.coli</i> Single Value "Exceedances" (1997 to 2001)				
		"Beach Use" Water Contact	"Moderate Use" Water Contact	"Light Use" Water Contact	"Infrequent Use" Water Contact
Monitoring Location	Single Values No. Samples	235/100 ml	298/100 ml	410/100 ml	576/100 ml
EF Jarbidge ab Murphys (NAC 445A.218)	15	1 exceedance 7%	1 exceedance 7%	0 exceedance 0%	0 exceedance 0%
WF Jarbidge ab Jarbidge (NAC 445A.219)	15	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
WF Jarbidge blw Jarbidge (NAC 445A.220)	14	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
WF Bruneau at Mink Ranch (NAC 445A.221)	10	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
EF Owyhee ab Mill Creek (NAC 445A.222)	15	2 exceedances 13%	2 exceedances 13%	2 exceedances 13%	1 exceedance 7%
Owyhee blw Mill Creek (NAC 445A.223)	6	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Owyhee blw Slaughtrhse Cr. (NAC 445A.223)	6	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Salmon Falls Creek (NAC 445A.216)	14	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Shoshone Creek (NAC 445A.217)	15	2 exceedances 13%	2 exceedances 13%	2 exceedances 13%	2 exceedances 13%

Footnote: Proposed bacterial criteria for control points shown as unshaded boxes under numerical single value limits.

<i>E. coli</i> Annual Geometric Mean (A.G.M.) "Exceedances"		
(1997 to 2001)	A.G.M.	126/100 ml
	No. Samples	
EF Owyhee ab Mill Creek (NAC 445A.222)	5	2 exceedances 40%

TRUCKEE RIVER SYSTEM

Designated Use: Contact Water Recreation

Monitoring Location	<i>E. coli</i> Single Value "Exceedances" (1997 to 2001)				
		"Beach Use" Water Contact	"Moderate Use" Water Contact	"Light Use" Water Contact	"Infrequent Use" Water Contact
	Single Values No. Samples	235/100 ml	298/100 ml	410/100 ml	576/100 ml
Truckee River at Farad (NAC 445A.184)	57	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Truckee River at Circle C Rnch (NAC 445A.184)	57	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Truckee River at Idlewild Pk (NAC 445A.185)	56	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Truckee River at Vista Gage (NAC 445A.187)	55	5 exceedances 9%	3 exceedances 5%	2 exceedances 4%	1 exceedance 2%

Footnote: Proposed bacterial criteria for control points shown as unshaded boxes under numerical single-value limits.

No exceedances of *E. coli* Annual Geometric Mean criteria at Truckee River control points.

COLORADO RIVER SYSTEM

Designated Use: Contact Water Recreation for Colorado River

Monitoring Location	<i>E. coli</i> Single Value "Exceedances" (1997 to 2001)				
		"Beach Use" Water Contact	"Moderate Use" Water Contact	"Light Use" Water Contact	"Infrequent Use" Water Contact
	Single Values No. Samples	235/100 ml	298/100 ml	410/100 ml	576/100 ml
Colorado River blw Hoover Dam (Willow Beach) (NAC 445A.193)	18	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Colorado River blw Davis Dam (Laughlin) (NAC 445A.192)	18	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%

Footnote: Proposed bacterial criteria for control points shown as unshaded boxes under numerical single-value limits.

No exceedances of *E. coli* Annual Geometric Mean criteria at the Colorado River control points.

MUDDY RIVER SYSTEM

Designated Use: Non-Contact Water Recreation

<i>E. coli</i> Annual Geometric Mean (A.G.M.) "Exceedances"		
(1997 to 2001)	A.G.M.	630/100 ml
	No. Samples	No. Samples
Muddy River at Glendale (NAC 445A.210)	5	0 exceedance 0%
Muddy River at Overton (NAC 445A.211)	5	0 exceedance 0%

Footnote: Proposed bacterial criteria for control points shown as unshaded boxes under numerical single-value limits.

VIRGIN RIVER SYSTEM

Designated Use: Non-Contact Water Recreation for Virgin River
Water Contact Recreation for Beaver Dam Wash & Snake Creek

<i>E. coli</i> Annual Geometric Mean (A.G.M.) "Exceedances"		
(1997 to 2001)	A.G.M.	630/100 ml
	No. Samples	No. Samples
Virgin River at Mesquite (NAC 445A.175)	5	0 exceedance 0%
Virgin River at Riverside (NAC 445A.177)	5	0 exceedance 0%

Footnote: Proposed bacterial criteria for control points shown as unshaded boxes under numerical single-value limits.

<i>E. coli</i> Single Value "Exceedances" (1997 to 2001)					
		"Beach Use" Water Contact	"Moderate Use" Water Contact	"Light Use" Water Contact	"Non-Contact" Water Recreat'n
Monitoring Location	Single Values	235/100 ml	298/100 ml	410/100 ml	576/100 ml
	No. Samples				
Beaver Dam Wash (NAC 445A.178)	3	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Snake Creek (NAC 445A.179)	4	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%

Footnote: Proposed bacterial criteria for control points shown as unshaded boxes under numerical single-value limits.

No exceedances of *E. coli* Annual Geometric Mean criteria at Beaver Dam Wash and Snake Creek control points.

WALKER RIVER SYSTEM

Designated Use: Contact Water Recreation

	<i>E.coli</i> Single Value "Exceedances" (1997 to 2001)				
		"Beach Use" Water Contact	"Moderate Use" Water Contact	"Light Use" Water Contact	"Infrequent Use" Water Contact
Monitoring Location	Single Values No. Samples	235/100 ml	298/100 ml	410/100 ml	576/100 ml
West Walker at the state line (NAC 445A.160)	29	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Topaz Lake (NAC 445A.161)	26	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
West Walker near Wellington (NAC 445A.162)	29	1 exceedance 3%	1 exceedance 3%	0 exceedance 0%	0 exceedance 0%
West Walker at Nordyke Road (NAC 445A.163)	29	3 exceedances 10%	2 exceedances 7%	1 exceedance 3%	0 exceedance 0%
Sweetwtr Creek (NAC 445A.164)	28	6 exceedances 21%	5 exceedances 18%	4 exceedance 14%	3 exceedance 11%
East Walker at the state line (NAC 445A.165)	26	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
East Walker at Nordyke Road (NAC 445A.166)	29	3 exceedances 10%	2 exceedances 7%	1 exceedance 3%	0 exceedance 0%
Walker River at Wabuska (NAC 445A.167)	30	1 exceedance 3%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Desert Creek (NAC 445A.169)	25	1 exceedance 4%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Walker Lake	29	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%

Footnote: Proposed bacterial criteria for control points shown as unshaded boxes under numerical single value limits.

<i>E. coli</i> Annual Geometric Mean (A.G.M.) "Exceedances" (1997 to 2001)		
	A.G.M.	126/100 ml
	No. Samples	
Sweetwtr Creek (NAC 445A.164)	5	1 exceedance 20%

HUMBOLDT RIVER SYSTEM

Designated Use: Contact Water Recreation

	<i>E.coli</i> Single Value "Exceedances" (1997 to 2001)				
		"Beach Use" Water Contact	"Moderate Use" Water Contact	"Light Use" Water Contact	"Infrequent Use" Water Contact
Monitoring Location	Single Values No. Samples	235/100 ml	298/100 ml	410/100 ml	576/100 ml
Humboldt River near Osino (NAC 445A.203)	26	2 exceedances 8%	1 exceedance 4%	1 exceedance 4%	0 exceedance 0%
Humboldt River at Palisade (NAC 445A.204)	15	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Humboldt River at Battle Mtn. (NAC 445A.205)	28	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Humboldt River at Comus (NAC 445A.206)	29	1 exceedance 3%	1 exceedance 3%	1 exceedance 3%	0 exceedance 0%
Humboldt River at Imlay (NAC 445A.207)	29	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%	0 exceedance 0%
Humboldt River at Woolsey (blw Rye Patch) (NAC 445A.208)	26	1 exceedance 4%	1 exceedance 4%	0 exceedance 0%	0 exceedance 0%

Footnote: Proposed bacterial criteria for control points shown as unshaded boxes under numerical single-value limits.

No exceedances of *E. coli* Annual Geometric Mean criteria at Humboldt River control points.